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(54) LIGHT EMITTING ELEMENT AND DISPLAY DEVICE USING SAME

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a light emitting element capable of improving picture quality by reducing reflection of outer light or an outer view.
SOLUTION: A resonator structure is provided to resonate light emitted from a light-emitting layer 13B between a first end P1 and a second end P2 and take it out from the side of the second end P2. Intensity and phase of reflected lights h1h2 of the outer light at the side of the first end P1 and the second end P2 are adjusted so that a reflectance of the outer light H at a resonance frequency incident from the second end P2 becomes 20% or less. More specificallyadjusted so that the intensities becomes almost same with each other and phases are reversed from each other. The intensities of the reflected lights h1h2 are adjusted by materials and thicknesses of a first electrode 12 and a second electrode 14. The phases of the reflected lights h1h2 are adjusted by a optical distance L between the first end P1 and the second end P2.

CLAIMS

[Claim(s)]
[Claim 1]
It is a light emitting device which has the resonator structure which resonates light generated in a luminous layer between the 1st end and the 2nd endand takes out light from said 2nd end side at least
A light emitting devicewherein reflectance of outdoor daylight in resonant wavelength which enters from said 2nd end side is 20% or less.
[Claim 2]
The light emitting device according to claim 1 characterized by adjusting intensity and a phaserespectively about catoptric light of said near outdoor daylight of said 1st end side and said 2nd end so that reflectance of said outdoor daylight may be 20% or less.
[Claim 3]
The light emitting device according to claim 1 having an organic layer which contains said luminous layer between said 1st end and said 2nd end.
[Claim 4]
The light emitting device according to claim 1 which has a semipermeability reflecting layer at said 2nd endand is characterized by an extinction coefficient of this semipermeability reflecting layer being 0.5 or more.
[Claim 5]
The light emitting device according to claim 4 to which said semipermeability reflecting layer is characterized by a refractive index being one or less.
[Claim 6]
If peak wavelength of a spectrum of light which wants to take out optical distance between phisaid 1st endand said 2nd end for a phase shift of catoptric light produced at said 1st end and said 2nd end from said L and 2nd end side is set to lambda
The light emitting device according to claim 1wherein said optical distance fills several 1.
[Equation 1]

[Claim 7]
The light emitting device according to claim 1 provided with a light filter which makes light taken out from said 2nd end side penetrate.

[Claim 8]
It is the display provided with a light emitting device which has the resonator structure which resonates light generated in a luminous layer between the 1st end and the 2nd endand takes out light from said 2nd end side at least
A displaywherein reflectance of outdoor daylight in resonant wavelength which enters from said 2nd end side is 20% or less.
[Claim 9]
The display according to claim 8 characterized by adjusting intensity and a phaserespectively about catoptric light of said near outdoor daylight of said 1st end side and said 2nd end so that reflectance of said outdoor daylight may be 20% or less.
[Claim 10]
The display according to claim 8 having an organic layer which contains said luminous layer between said 1st end and said 2nd end.
[Claim 11]
The display according to claim 8 which has a semipermeability reflecting layer at said 2nd endand is characterized by an extinction coefficient of this semipermeability reflecting layer being 0.5 or more.
[Claim 12]
The display according to claim 11 in which said semipermeability reflecting layer is characterized by a refractive index being one or less.
[Claim 13]
If peak wavelength of a spectrum of light which wants to take out optical distance between phisaid 1st endand said 2nd end for a phase shift of catoptric light produced at said 1st end and said 2nd end from said L and 2nd end side is set to lambda
The display according to claim 8wherein said optical distance fills several 2.
[Equation 2]

[Claim 14]
The display according to claim 8 provided with a light filter which makes light taken out from said 2nd end side penetrate.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
This invention relates to the display using the light emitting device and this which have the resonator structure which resonates the light generated in the luminous layer between the 1st end and the 2nd endand relates to the display using the organic light emitting element and this which were especially provided with such resonator structure.
[0002]
[Description of the Prior Art]
In recent yearsthe organic luminescent display using the organic light emitting element as a display which replaces a liquid crystal display attracts attention. It is thought that it has the characteristic that its angle of visibility is large since an organic luminescent display is a spontaneous light typeand power consumption is lowand has sufficient response also to the high-speed video signal of a high definition. Development is furthered towards utilization.

[0003]
About the organic light emitting elementthe trial which controls the light generated in a luminous layersuch as raising the color purity of the luminescent color or raising luminous efficiencyhas so far been performed by introducing resonator structure (for examplerefer to patent documents 1.).
[0004]
[Patent documents 1]
International publication pamphlet 01/39554
[0005]
[Problem(s) to be Solved by the Invention]
Howeverthe problem that the image quality of a display image will deteriorate by reflected [a view] in outdoor daylight reflection of a display surface or outside was left behind to the organic light emitting element. In order to solve thisarranging a circular light boardfor example to the display surface side is proposed. Howeverin this compositionsince the light generated in the luminous layer is also attenuated to 50% or less with a circular light boardluminosity fallsand if luminosity is secureda rise of power consumption or short-life-ization of a display will be caused.
[0006]
The method of using together the light filter of optical absorption nature set by each luminescent color or the light filter of fluorescence

is also proposed. In this methodalthough the reflectance in wavelength other than the luminescent color of a pixel falls greatlysince the reflectance in the wavelength in the luminescent color neighborhood does not fall so muchit cannot fully remove influence of outdoor daylight.

[0007]

This invention was made in view of this problemand the purpose is to provide the display using the light emitting device and this which can raise image quality by outdoor daylight reflection or outside reducing reflected [a view].

[0008]

[Means for Solving the Problem]

Reflectance of outdoor daylight in resonant wavelength which a light emitting device by this invention has the resonator structure which resonates light generated in a luminous layer between the 1st end and the 2nd endtakes out light from the 2nd end side at leastand enters from the 2nd end side is 20% or less.

[0009]

A display by this invention has the resonator structure which resonates light generated in a luminous layer between the 1st end and the 2nd endReflectance of outdoor daylight in resonant wavelength which enters from the 2nd end side of a light emitting device using a light emitting device which takes out light from the 2nd end side at least is 20% or less.

[0010]

In a light emitting device and a display by this inventionsince it was made for reflectance of outdoor daylight in resonant wavelength to be 20% or lessreflectance of outdoor daylight in wavelength of the luminescent color neighborhood becomes smallandin outsidereflected [a view] is prevented.

[0011]

[Embodiment of the Invention]

Hereafteran embodiment of the invention is described in detail with reference to Drawings.

[0012]

[A 1st embodiment]

Drawing 1 expresses the section structure of the display using the organic light emitting element which is a light emitting device concerning a 1st embodiment of this invention. This display is used as an organic ultra-thin type luminescence color display device etc.and the placed opposite of the drive panel 10 and the closure panel 20 is carried outfor examplethe whole surface is stuck by the glue line 30.

The organic light emitting element 10R which generates a red lightthe organic light emitting element 10G which generates a green lightand the organic light emitting element 10B which generates a blue light are formed as a whole in order at matrix form on the substrate 11 for a drive with which the drive panel 10 consists of insulating materialssuch as glass.

[0013]

From the substrate 11 side for a drivethe 1st electrode 12 as the anodethe organic layer 13and the 2nd electrode 14 as the negative pole are laminated by this orderandas for these organic light emitting elements 10R10Gand 10Bthe protective film 15 is formed on the 2nd electrode 14 if neededfor example.

[0014]

The 1st electrode 12 serves also as the function as a reflecting layerand when making it have the highest possible reflectance raises luminous efficiencyit is desirable. For exampleif it makes it in general the grade and concrete target in which light does not penetrate the thickness (only henceforth thickness) of a laminating direction with not less than 100 nm using material with a real part refractive index low as much as possible in using material with a metaled high extinction coefficientsince reflectance can be made highit is desirable. It is preferred for thickness to be about 200 nm and to specifically constitute with the simple substance or alloys of a high metallic element of a work functionsuch as platinum (Pt)gold (Au)chromium (Cr)or tungsten (W). To the 1st electrode 12another element may be added to such an extent that a difference substantial to an optical constant is not produced.

[0015]

The organic layer 13 differs in composition with the luminescent color of the organic light emitting element 10. Drawing 2 expands and expresses the composition of the organic layer 13 in the organic light emitting elements 10R and 10B. As for the organic layer 13 of the organic light emitting elements 10R and 10Bit has the structure where the electron hole transporting bed 13Athe luminous layer 13Band the electron transport layer 13C were laminated sequentially from [this] the 1st electrode 12 side. The electron hole transporting bed 13A is for raising the hole-injection efficiency to the luminous layer 13B. According to this embodimentthe electron hole transporting bed 13A serves as the hole injection layer. The luminous layer 13B generates light by pouring of current. The electron transport layer 13C is for raising the electron injection efficiency to the luminous layer 13B.

[0016]
Thickness is about 45 nm and the electron hole transporting bed 13A of the organic light emitting element 10R is constituted by bis[(N-naphthyl) -N-phenyl] benzidine (alpha-NPD)for example. Thickness is about 50 nm and the luminous layer 13B of the organic light emitting element 10R is constituted by 25-screw [4-[N-(4-methoxypheny)-N-phenylamino]] styryl benzene 14-JIKABO nitril (BSB)for example. Thickness is about 30 nm and the electron transport layer 13C of the organic light emitting element 10R is constituted by the eight-quinolinol aluminium complex (Alq_3)for example.
[0017]
Thickness is about 30 nm and the electron hole transporting bed 13A of the organic light emitting element 10B is constituted by alpha-NPDfor example. Thickness is about 30 nm and the luminous layer 13B of the organic light emitting element 10B is constituted by 44-bis(22-diphenyl BININ)biphenyl (DPVBi)for example. Thickness is about 30 nm and the electron transport layer 13C of the organic light emitting element 10B is constituted by $Alq_3$for example.
[0018]
Drawing 3 expands and expresses the composition of the organic layer 13 in the organic light emitting element 10G. As for the organic layer 13 of the organic light emitting element 10Git has the structure where the electron hole transporting bed 13A and the luminous layer 13B were laminated sequentially from [this] the 1st electrode 12 side. The electron hole transporting bed 13A serves as the hole injection layerand the luminous layer 13B serves as the electron transport layer.
[0019]
Thickness is about 50 nm and the electron hole transporting bed 13A of the organic light emitting element 10G is constituted by alpha-NPDfor example. Thickness is about 60 nm and the luminous layer 13B of the organic light emitting element 10G is constituted by Alq_3 by what did 1 volume % mixing of the coumarin 6 (C6;Coumarin6)for example.
[0020]
The 2nd electrode 14 shown in drawing 1 thru/or drawing 3 serves as the function as a semipermeability reflecting layer. Namelythese organic light emitting elements 10R10Gand 10BThe end face by the side of the luminous layer 13B of the 1st end P1 and the 2nd electrode 14 is used as the 2nd end P2 for the end face by the side of the luminous layer 13B of the 1st electrode 12and it has the resonator structure which the light generated in the luminous layer 13B is resonatedand is taken out from the 2nd end P2 side by making the organic layer 13 into a resonance part.

Thusif it is made to have resonator structurewhen the light generated in the luminous layer 13B causes multiple interference and acts as a kind of narrow band filtersince the half breadth of the spectrum of the light taken out can decrease and color purity can be raisedit is desirable. Since reflectance of the outdoor daylight in the organic light emitting elements 10R10Gand 10B can be made very small with combination with the light filter 22 (refer to drawing 1) which can attenuate by multiple interference and for which the outdoor daylight which entered from the closure panel 20 is also mentioned laterit is desirable.
[0021]
For that purposeas for the optical distance L between the 1st end P1 of a resonatorand the 2nd end P2it is preferred to make it fill several 3 and to coincide the resonant wavelength (peak wavelength of the spectrum of the light taken out) of a resonator and the peak wavelength of the spectrum of light to take out. As for the optical distance Lit is preferred actually to choose so that it may become the positive minimum which fills several 3.
[0022]
[Equation 3]
(2L) /lambda+phi/(2 pi) =m
(The phase shift (rad) of the catoptric light which produces L among a formula in the optical distance between the 1st end P1 and the 2nd end P2and produces phi at the 1st end P1 and the 2nd end P2the peak wavelength of the spectrum of the light which wants to take out lambda from the 2nd end P2 sideand m express the integer from which L becomes positiverespectively.) Although a unit should be [L and lambda] just common in several 3let (nm) be a unitfor example.
[0023]
The 2nd electrode 14 is constituted by the metallic materialfor example. The extinction coefficient of a metallic material is largeand since the optical absorption in the 2nd electrode 14 arisesit is preferred that optical absorption chooses the material which becomes small. It is because the light is not emitted anywhereso the loss by a self-absorption will cause decline in luminous efficiency. The case where drawing 4 set the extinction coefficient to -4iand a real part refractive index is changed by 0.1 units or less [0.1 or more] by 1.1. Express the light absorption rate over thickness and ask with the absorptivity calculation method in a common optical multilayered film. (For examplereferencessuch as Principles of OpticsMax Born and Emil Wolfand 1974 (PERGAMON PRESS)). Optical absorption becomes smallso that a real part refractive index is smalland drawing 4 shows that it is

desirable. In losing smallnamelyfor examplesilver (Ag)(0.055-3.32i:550nm)Aluminum (aluminum)(0.7-5.0i:500nm)(0.57-3.47i:546nm)[magnesium (Mg)] Calcium (Ca)(0.7-5.0i:500nm)(0.029-2.32i:546nm)[sodium (Na)] As for gold (0.035-2.40i: 546 nm)copper (Cu)(0.91-2.40i:540nm)platinum (0.92-2.6i: 500 nm)etc.it is preferred that a real part refractive index constitutes the 2nd electrode 14 with the material which becomes one or less in general. When the 2nd electrode 14 is especially used as the negative pole like this embodimenta simple substance or alloyssuch as a small material of a work functionfor examplealuminummagnesiumcalciumand sodiumare suitable among the above-mentioned examples. To the 2nd electrode 14another element may be added to such an extent that a difference substantial to an optical constant is not produced.

[0024]

In the organic light emitting elements 10R10Gand 10Bit is adjusted so that reflectance of outdoor daylight in resonant wavelength which enters from the 2nd end P2 side may be 20% or less. Intensity and a phase are adjustedrespectively about catoptric light of near outdoor daylight of the 1st end P1 side and the 2nd end P2for exampleintensity is almost the sameand specificallyit is constituted so that a phase may be mostly reversedso that reflectance of outdoor daylight in resonant wavelength may be 20% or less. It is because it is necessary to make outdoor daylight reflectance into 20% or less in order to obtain image quality of a display using the high-contrast-ized conventional CRT (cathode-ray tube; Cathode Ray Tube)and an equivalent level. Being adjusted is preferred so that it may become 15% or lessand if reflectance of outdoor daylight in resonant wavelength which enters from the 2nd end P2 side is adjusted so that it may become 5% or lessit is more preferred. Herecatoptric light of near outdoor daylight of the 1st end P1 means a synthetic wave of all the catoptric light produced in the 1st end P1 sideand catoptric light of near outdoor daylight of the 2nd end P2 means a synthetic wave of all the catoptric light produced in the 2nd end P2 side. In this embodimentas shown in drawing 5the catoptric light h1 of the near outdoor daylight H of the 1st end P1It is the catoptric light produced in an interface of the 1st electrode 12 and the organic layer 13and the catoptric light h2 of the near outdoor daylight H of the 2nd end P2 is a synthetic wave with catoptric light produced in an interface of a side which is not in contact with catoptric light and the luminous layer 13B which are produced in an interface of the 2nd electrode 14 and the organic layer 13and the organic layer 13 of the 2nd electrode 14.

[0025]

The catoptric light h1 and intensity of h2 are adjusted by choosing material and thickness of the 1st electrode 12 and the 2nd electrode 14. Drawing 6 sets an extinction coefficient to -4iexpresses a rate of a light reflex to thickness at the time of changing a real part refractive index by 0.1 units or less [0.1 or more] by 1.1and asks for it by the reflectivity calculation method of a common optical multilayered film. From drawing 6by changing thickness or material shows that a range which a rate of a light reflex can be changed 0% to a maximum of 90%and a rate of a light reflex can takeso that a refractive index is small becomes large. If a refractive index is especially made or less into onea rate of a light reflex can be changed from 0% to not less than about 70%and it is desirable.

[0026]

Drawing 7 sets a refractive index to 0.5a rate of a light reflex and drawing 8 to thickness at the time of changing an extinction coefficient by 0.5 units from 0 to -5.0 set a refractive index to 0.5and a light absorption rate over thickness at the time of changing an extinction coefficient by 0.5 units from 0 to -5.0 is expressedrespectively. These rates of a light reflex and light absorption rates are searched for with a calculation method of a common optical multilayered film. If an extinction coefficient is made less than -0.5 (0.5 or more) as shown in drawing 7a rate of a light reflex can be changed from 0% to not less than about 80%and it is desirable. Since the range of a value which a rate of a light reflex can take can become large and it can be made to change from 0% to not less than about 90% if an extinction coefficient is made less than -2.0 (2 or more)it is more desirable. Howeversince a light absorption rate also becomes large as shown in drawing 8it is preferred to adjust thickness so that a light absorption rate may become as small as possible.

[0027]

About a phaseif it is made for the optical distance L between the 1st end P1 and the 2nd end P2 to fill several 2it will be adjusted so that the catoptric light h1 shown in drawing 5 and the catoptric light h2 may be mostly reversed.

[0028]

The protective film 15 shown in drawing 1 is a passivation film which thickness is not less than 500 nm 10000 nm or lessand consists of transparent dielectricsfor example. The protective film 15 is constituted by silicon oxide (SiO_2)silicon nitride (SiN)etc.for example.

[0029]

As shown in drawing 1the closure panel 20 is located in the 2nd

electrode 14 side of the drive panel 10and has the substrate 21 for closure which closes the organic light emitting elements 10R10Gand 10B with the glue line 30. The substrate 21 for closure is constituted by materialssuch as transparent glassto light generated in the organic light emitting elements 10R10Gand 10B. The light filter 22 is formed in the substrate 21 for closureand take out to it light generated in the organic light emitting elements 10R10Gand 10Bandfor example. Outdoor daylight reflected in wiring of the organic light emitting elements 10R10Gand 10B and the meantime is absorbedand contrast is improved.
[0030]
Although the light filter 22 may be formed in which field of the substrate 21 for closurebeing provided in the drive panel 10 side is preferred. It is because the light filter 22 cannot be exposed to the surface and can protect by the glue line 30. The light filter 22 has the red filter 22Rthe green filter 22Gand the blue filter 22Band is arranged in order corresponding to the organic light emitting elements 10R10Gand 10B.
[0031]
The red filter 22Rthe green filter 22Gand the blue filter 22B are formed without a crevice with rectangular shaperespectively. These red filter 22Rthe green filter 22Gand the blue filter 22BIt is constituted by resin which mixed paintsrespectivelyand by choosing paintsred who considers it as the purposeand light transmittance in a green or blue wavelength band are highand it is adjusted so that light transmittance in other wavelength bands may become low.
[0032]
A wavelength range with high transmissivity in the light filter 22 and peak wavelength lambda of a spectrum of light taken out from resonator structure are in agreement. Only what has wavelength equal to peak wavelength lambda of a spectrum of light which this takes out among the outdoor daylight h which enters from the closure panel 20 penetrates the light filter 22and the outdoor daylight h of other wavelength is prevented from invading into the organic light emitting elements 10R10Gand 10B.
[0033]
These organic light emitting elements 10R10Gand 10B can be manufactured as followsfor example.
[0034]
Drawing 9 and drawing 10 express ******** for a manufacturing method of this display. Firstas shown in drawing 9 (A)on the substrate 11 for a drive which consists of material mentioned abovefor example by DC

sputteringmembranes are formed by thickness which mentioned above the 1st electrode 12 that consists of material mentioned abovefor exampleit etches selectively using a lithography technologyand patterns after predetermined shape. Thenas similarly shown in drawing 9 (A)the electron hole transporting bed 13Athe luminous layer 13Bthe electron transport layer 13Cand the 2nd electrode 14 which consist of thickness and material which were mentioned above with vacuum deposition are formed one by oneand the organic light emitting elements 10R10Gand 10B as shown in drawing 2 and drawing 3 are formed. Thenthe protective film 15 is formed on the 2nd electrode 14 if needed. Therebythe drive panel 10 is formed.

[0035]

As shown in drawing 9 (B)on the substrate 21 for closure which consists of material mentioned abovematerial of the red filter 22R is applied with a spin coat etc.and the red filter 22R is formed by patterning with photolithography technique and calcinating. Thenas similarly shown in drawing 9 (B)the blue filter 22B and the green filter 22G as well as the red filter 22R are formed one by one. Therebythe closure panel 20 is formed.

[0036]

After forming the closure panel 20 and the drive panel 10as shown in drawing 10 (A)the glue line 30 is formed on the protective film 15. As shown in drawing 10 (B) after itthe drive panel 10 and the closure panel 20 are pasted together via the glue line 30. In that caseit is preferred to make a field of a side which formed the light filter 22 among the closure panels 20 counter with the drive panel 10and to arrange it. By the abovethe drive panel 10 and the closure panel 20 paste upand a display shown in drawing 1 thru/or drawing 3 is completed.

[0037]

In this displayif predetermined voltage is impressed between the 1st electrode 12 and the 2nd electrode 14current will be poured into the luminous layer 13Band when an electron hole and an electron recombineluminescence will take place mainly in an interface of the luminous layer 13B. The multiple echo of this light is carried out between the 1st electrode 12 and the 2nd electrode 14and it penetrates the 2nd electrode 14the protective layer 15the light filter 22and the substrate 21 for closureand is taken out. Although outdoor daylight enters from the substrate 21 side for closure at this timeoutdoor daylight other than resonant wavelength is absorbed with the light filter 22and it is decreased by multiple interference in the organic light emitting elements 10R10Gand 10B. On the other handoutdoor daylight

of resonant wavelength penetrates the light filter 22enters into the organic light emitting elements 10R10Gand 10Band is mainly reflected in the 2nd electrode 14 and the 1st electrode 12. Howeverby adjusting intensity and a phase in this embodimentrespectively about catoptric light of outdoor daylight in the 1st end P1 P2i.e.1st electrode 12 and 2nd endside 14i.e.the 2nd electrodeSince it is constituted so that reflectance in the organic light emitting elements 10R10Gand 10B may be 20% or lesscatoptric light taken out by penetrating the substrate 21 for closure becomes very small. Thereforein outdoor daylight reflection or outsidereflected [a view] is reduced.

[0038]

Thussince it was made for reflectance of the outdoor daylight H in resonant wavelength which enters from the 2nd end P2 14i.e.2nd electrodeside to be 20% or less according to this embodimentoutdoor daylight reflection or outside can reduce reflected [a view]and image quality can be raised.

[0039]

If it is made to make an extinction coefficient of the 2nd electrode 14 into 0.5 or more and 2 or more especiallythe range of a value which a rate of a light reflex of the 2nd electrode 14 can take can be made large. Thereforethe near catoptric light h1 of the 2nd end P2 and intensity of h2 can be easily adjusted the 1st end P1 side so that reflectance of the outdoor daylight H in resonant wavelength may be 20% or less.

[0040]

If it is made to make a refractive index of the 2nd electrode 14 or less into one especiallyabsorption in the 2nd electrode 14 can be made smalland light generated in the luminous layer 13B can be taken out efficiently.

[0041]

[A 2nd embodiment]

Drawing 11 expresses section structure of an organic light emitting element which is a display device concerning a 2nd embodiment of this invention. These organic light emitting elements 40R40Gand 40B are the same as the organic light emitting elements 10R10Gand 10B explained by a 1st embodiment except for the thin film layer 16 for hole injections being formed between the 1st electrode 12 and the organic layer 13. Thereforethe same numerals are given to the same component and the detailed explanation is omitted.

[0042]

The thin film layer 16 for hole injections is for raising hole-injection

efficiency to the organic layer 13and is constituted by material in which a work function is higher than the 1st electrode 12. The thin film layer 16 for hole injections also has a function as a protective film of easing the anode 12 receiving a damage also in a manufacturing process after forming the 1st electrode 12. As a material which constitutes the thin film layer 16 for hole injectionsFor examplechromiumnickel (nickel)cobalt (Co)molybdenum (Mo)Metalsuch as platinum or silicon (Si)or an alloy containing at least one of sorts of theseOr transparent conductive materialssuch as an oxide of these metal or an alloya nitrideor ITO (Indium-Tin Oxide: indium (In) and oxide film mixture of tin (Sn))are mentioned. As for thickness of the thin film layer 16 for hole injectionsit is preferred to determine according to transmissivity and conductivity of light of a component. For examplewhen an oxide and a nitride which are not expensive constitute out of conductivitysuch as chromium(III) oxide (Cr_2O_3)the thinner one is preferredfor examplebeing referred to as about 5 nm is preferred. Also when metal with low transmissivity with high conductivity constitutesthe thinner one is preferredfor examplebeing referred to as several nanometers is preferred. On the other handwhen high ITO constitutes conductivity and transmissivityit is possible to thicken to several nanometers - about tens of nm. The thin film layer 16 for hole injections is constituted from this embodiment by chrome oxide (II) (CrO)for example.
[0043]
When the thin film layer 16 for hole injections is formed like this embodimentthe catoptric light h1 of the near outdoor daylight H of the 1st end P1 is a synthetic wave with catoptric light produced in an interface of catoptric light and the thin film layer 16 for hole injections which are produced in an interface of the 1st electrode 12 and the thin film layer 16 for hole injectionsand the organic layer 13. It depends on material [whether catoptric light in which interface becomes large] of the thin film layer 16 for hole injections. For examplewhen an optical constant constitutes the thin film layer 16 for hole injections by a thing near the organic layer 13 like chrome oxide (II). A direction of catoptric light produced in an interface of the 1st electrode 12 and the thin film layer 16 for hole injections becomes largethe thin film layer 16 for hole injections is also contained in a resonance partand the 1st end P1 serves as an interface of the 1st electrode 12 and the thin film layer 16 for hole injections. For examplewhen metalsuch as platinum (Pt)constitutes the thin film layer 16 for hole injectionsA direction of catoptric light produced in an interface of the thin film layer 16 for hole injections and the organic

layer 13 becomes largethe thin film layer 16 for hole injections is not contained in a resonance partbut the 1st end P1 serves as an interface of the thin film layer 16 for hole injectionsand the organic layer 13.
[0044]
Even if constituted in this waythe same effect as a 1st embodiment of the above can be acquired.
[0045]
[Example]
Concrete working example of this invention is described.
[0046]
(Working example 1)
The organic light emitting elements 40R40Gand 40B which have the same composition as a 2nd embodiment of the above were producedrespectively. At that timethe aluminum system alloy 98 mass % Containing aluminum or aluminum constituted the 1st electrode 12and it was 200 nm in thickness. Chrome oxide (II) constituted the thin film layer 16 for hole injectionsand it was 4 nm in thickness. The material illustrated by the above-mentioned embodiment constituted the organic layer 13the sum total thickness was 125 nm in the organic light emitting element 40Rand was 110 nm in the organic light emitting element 40Gand it was 93 nm in it by the organic light emitting element 40B. It is the electron transport layer 13C in the layer 40R and 40B which is in contact with the 2nd electrode 14 among the organic layers 13i.e.organic light emitting elementsand the refractive index of the luminous layer 13B is all about 1.7 in the organic light emitting element 40G. The same material as the 1st electrode 12 constituted the 2nd electrode 14and it was 17 nm in thickness. The material of the refractive index 1.5 constituted the protective film 15. Thusby adjusting the optical distance L of materialssuch as the 1st electrode 12 and the 2nd electrode 14thicknessand the organic layer 13The catoptric light h1 in the 1st electrode 12 of the outdoor daylight H in resonant wavelength and the catoptric light h2 in the 2nd electrode 14 have the almost same intensityand it was made mostly reversed [a phase]. About the produced organic light emitting elements 40R40Gand 40Boutdoor daylight was entered by zero incidence angle from the 2nd electrode 14 sideand the reflectance was investigatedrespectively. The reflection spectrum of the organic light emitting elements 40R40Gand 40B is shown in drawing 12. As shown in drawing 12about the organic light emitting element 40Rthe reflectance of the outdoor daylight in the resonant wavelength of about 630 nm became 2%. About the organic light emitting element 40Gthe reflectance of the outdoor daylight in the resonant wavelength of about

540 nm became 0.5%. About the organic light emitting element 40Bthe reflectance of the outdoor daylight in the resonant wavelength of about 450 nm became 2%.

[0047]

(Working example 2)

The catoptric light h1 in the 1st electrode [in / except for having changed the thickness of the organic layer 13 and the 2nd electrode 14and the material of the protective film 15the organic light emitting elements 40R40Gand 40B are produced like working example 1respectivelyand / resonant wavelength] 12The catoptric light h2 in the 2nd electrode 14 has the almost same intensityand it was made mostly reversed [a phase]. The sum total thickness of the organic layer 13 was 128 nm in the organic light emitting element 40Rwas 112 nm in the organic light emitting element 40Gand was 95 nm in the organic light emitting element 40B. The thickness of the 2nd electrode 14 was 17 nm. The material of the refractive index 1.9 constituted the protective film 15. About the produced organic light emitting elements 40R40Gand 40Boutdoor daylight was entered by zero incidence angle from the 2nd electrode 14 sideand the reflectance was investigatedrespectively. The reflection spectrum of the organic light emitting elements 40R40Gand 40B is shown in drawing 13. As shown in drawing 13about the organic light emitting element 40Rthe reflectance of the outdoor daylight in the resonant wavelength of about 630 nm became 2%and was able to obtain the same result as working example 1. About the organic light emitting element 40Gthe reflectance of the outdoor daylight in the resonant wavelength of about 540 nm became 0.5%and was able to obtain the same result as working example 1. About the organic light emitting element 40Bthe reflectance of the outdoor daylight in the resonant wavelength of about 450 nm became 3%and was able to obtain the almost same result as working example 1.

[0048]

That isit turned out that reflectance can be made into 20% or lessand image quality can be improved about the catoptric light h1 by the side of the 1st end P1 of the outdoor daylight H in resonant wavelengthand the catoptric light h2 by the side of the 2nd end P2 if intensity and a phase are adjusted.

[0049]

As mentioned abovealthough the embodiment was mentioned and this invention was explainedthis invention is not limited to the above-mentioned embodimentand can change variously. For examplematerial and thickness or a method for film depositiona film formation conditionetc.

of each class explained in the above-mentioned embodiment are not limitedand are good also as other methods for film deposition and film formation conditions good also as other materials and thickness or. For examplealthough the 1st electrode 12the organic layer 13and the 2nd electrode 14 were laminated in order from the substrate 11 side for a drive on the substrate 11 for a drive and the case where light was taken out from the closure panel 20 side was explained in the above-mentioned embodimentBuilt-up sequence is made reverseon the substrate 11 for a drivethe 2nd electrode 14the organic layer 13and the 1st electrode 12 are laminated sequentially from the substrate 11 side for a driveand light can be taken out from the substrate 11 side for a drive.
[0050]
Although the above-mentioned embodimentfor exampleexplained the case where used the 1st electrode 12 as the anode and the 2nd electrode 14 was used as the negative polethe anode and the negative pole are made reverse and it is good also considering the negative pole and the 2nd electrode 14 as the anode in the 1st electrode 12. In this casealthough a simple substance or alloyssuch as money with a big work functionsilverplatinumand copperare preferred as a material of the 2nd electrode 14other materials can also be used by forming the thin film layer 16 for hole injections. To the 2nd electrode 14another element may be added to such an extent that a difference substantial to an optical constant is not produced. Use the 1st electrode 12 as the negative poleand the 2nd electrode 14 is used as the anodeand on the substrate 11 for a drivethe 2nd electrode 14the organic layer 13and the 1st electrode 12 are laminated sequentially from the substrate 11 side for a driveand light can be taken out from the substrate 11 side for a drive.
[0051]
Although the composition of the organic light emitting element was mentioned concretely and the above-mentioned embodiment explained itit needed to have no layerssuch as the thin film layer 16 for hole injectionsand the protective film 15and may have other layers further. For examplethe 1st electrode 12 can also be made into the two-layer structure which laminated the transparent conducting film in the upper part of reflection filmssuch as a dielectric multilayer or aluminum. In this casethe end face by the side of the luminous layer of this reflection film will constitute the end of a resonance partand a transparent conducting film will constitute a part of resonance part.
[0052]
Although the above-mentioned embodiment explained further again the case where the 2nd electrode 14 was constituted by the semipermeability

reflecting layerthe 2nd electrode 14 is good also as a structure where the semipermeability reflecting layer and the transparent electrode were laminated sequentially from the 1st electrode side. This transparent electrode is for lowering the electrical resistance of a semipermeability reflecting layer.
It is constituted by the conductive material which has sufficient translucency to the light generated in the luminous layer.
As a material which constitutes a transparent electrodethe compound which contains ITO or indiumand zinc (Zn) and oxygenfor example is preferred. It is because good conductivity can be obtained even if it forms membranes at a room temperature. The thickness of a transparent electrode can be not less than 30 nm 1000 nm or lessfor example. A semipermeability reflecting layer is used as one end in this casethe end of another side is provided in the position which counters a semipermeability electrode on both sides of a transparent electrodeand it may be made to form the resonator structure which makes a transparent electrode a resonance part. If the material which constitutes a transparent electrode for the protective film 15and the material which has a comparable refractive index constitute in establishing such resonator structurethe protective film 15 can be made into the part of a resonance partand it is desirable.
[0053]
This invention constitutes the 2nd electrode 14 with a transparent electrodeand. It is applicable also to the case where constituted so that the reflectance of the organic layer 13 of this transparent electrode and the end face of an opposite hand might become largeand the resonator structure which used the 1st endthe organic layer of a transparent electrodeand the end face of the opposite hand as the 2nd end for the end face by the side of the luminous layer 13B of the 1st electrode 12 is constituted. For exampleit is good also considering this interface as the 2nd end to enlarge reflectance in an interface with the protective film 15 or the glue line 30. A transparent electrode is contacted to a stratumreflectance of the interface of a transparent electrode and a stratum is enlargedwithout forming the protective film 15 and the glue line 30and it may be made to use this interface as the 2nd end.
[0054]
[Effect of the Invention]
As explained aboveaccording to a light emitting device according to any one of claims 1 to 6 or the display according to any one of claims 8 to 14. Since it was made for the reflectance of the outdoor daylight in the

resonant wavelength which enters from the 2nd end side to be 20% or lessoutdoor daylight reflection or outside can reduce reflected [a view]and image quality can be raised.
[0055]
Since the extinction coefficient of the semipermeability reflecting layer was especially made or more into 0.5 according to a light emitting device according to claim 3 or 4 or the display according to claim 10 or 11the range of the value which the reflectance of a semipermeability reflecting layer can take can be made large. Thereforethe intensity of the near catoptric light of the 2nd end can be easily adjusted the 1st end side so that the reflectance of the outdoor daylight in resonant wavelength may be 20% or less.
[0056]
Since the refractive index of the semipermeability reflecting layer was especially made or less into one according to a light emitting device according to claim 5 or the display according to claim 12absorption in a semipermeability reflecting layer can be made smalland the light generated in the luminous layer can be taken out efficiently.
[Brief Description of the Drawings]
[Drawing 1]It is a sectional view showing the composition of the display using the organic light emitting element which is a light emitting device concerning a 1st embodiment of this invention.
[Drawing 2]It is a sectional view which expands and expresses the composition of the organic layer in the organic light emitting element shown in drawing 1.
[Drawing 3]It is a sectional view which expands and expresses the composition of the organic layer in the organic light emitting element shown in drawing 1.
[Drawing 4]It is a figure showing the light absorption rate over the thickness at the time of setting an extinction coefficient to -4i and changing a real part refractive index by 0.1 units or less [0.1 or more] by 1.1.
[Drawing 5]It is a sectional view which expresses typically reflection of the outdoor daylight in the organic light emitting element shown in drawing 1.
[Drawing 6]It is a figure showing the rate of a light reflex to the thickness at the time of setting an extinction coefficient to -4i and changing a real part refractive index by 0.1 units or less [0.1 or more] by 1.1.
[Drawing 7]It is a figure showing the rate of a light reflex to the thickness at the time of setting a refractive index to 0.5 and changing

an extinction coefficient by 0.5 units from 0 to -5.0.
[Drawing 8]It is a figure showing the light absorption rate over the thickness at the time of setting a refractive index to 0.5 and changing an extinction coefficient by 0.5 units from 0 to -5.0.
[Drawing 9]It is a sectional view which expresses the manufacturing method of the display shown in drawing 1 to process order.
[Drawing 10]It is a sectional view showing the process of following drawing 9.
[Drawing 11]It is a sectional view showing the composition of the organic light emitting element which is a light emitting device concerning a 2nd embodiment of this invention.
[Drawing 12]It is a figure showing the reflection spectrum of the outdoor daylight in the organic light emitting element of working example 1 of this invention.
[Drawing 13]It is a figure showing the reflection spectrum of the outdoor daylight in the organic light emitting element of working example 2 of this invention.
[Description of Notations]
10 -- A drive panel10R10G10B40R40G40B -- Organic light emitting element11 [-- Electron hole transporting bed] -- The substrate for a drive12 -- The 1st electrode13 -- An organic layer13A 13B [-- A protective film16 / -- The thin film layer for hole injections20 / -- A closure panel21 / -- The substrate for closure22 / -- A light filter22R / -- A red filter22G / -- A green filter22B / -- A blue filter30 / -- Glue line] -- A luminous layer13C -- An electron transport layer14 -- The 2nd electrode15

DESCRIPTION OF DRAWINGS

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[Drawing 11]It is a sectional view showing the composition of the organic light emitting element which is a light emitting device concerning a 2nd embodiment of this invention.
[Drawing 12]It is a figure showing the reflection spectrum of the outdoor daylight in the organic light emitting element of working example 1 of this invention.
[Drawing 13]It is a figure showing the reflection spectrum of the outdoor daylight in the organic light emitting element of working example 2 of this invention.
[Description of Notations]
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